PATENT COOPERATION TREAT

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 85/TY00M41/WO	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/IB2004/003550	International filing date *(day/month/year)* 29.10.2004	Priority date *(day/month/year)* 19.11.2003
International Patent Classification (IPC) or national classification and IPC B60L3/00		
Applicant TOYOTA JIDOSHA KABUSHIKI KAISHA et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *sent to the applicant and to the International Bureau)* a total of sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
31.03.2005	01.02.2006
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Roider, A Telephone No. +49 89 2399-2330

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/IB2004/003550

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
1-21	as originally filed
Claims, Numbers	
1-7	as originally filed
Drawings, Sheets	
1/7-7/7	as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-7
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-7
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-7
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

The European patent application EP1261562 (D1) is regarded as being the closest prior art to the subject-matter of claims 1 and 7, and discloses an abnormality detection circuit comprising three sensors providing signals representative of measured voltages at a first inverter (28), at a second inverter (29) and at a battery (43).

Moreover, D1 discloses that differences between two pairs of detected voltage values (page 11, lines 6 and 15: $\Delta Vmg = |VM - VG|$ and $\Delta Vgb = |VG - VB|$) are calculated and then compared to first and second threshold values (Vth1 and Vth2) in order to determine which one of the detecting means (72, 75 or 76) is abnormal [see sections 0006 on page 2 and 0130-0132 on page 11].

The present invention differs from this prior art abnormality monitoring circuit in that:

> two difference values with respect to one reference value (estimated battery voltage value) are calculated and the monitoring is achieved on the basis of the relations of these difference values to a threshold value

Whereas as the prior art disclosed in D1 calculates a first difference value (ΔVmg) and compares it to a first reference value (Vth1) and uses the result of this comparison in combination with the result of the comparison of a second difference value (ΔVgb) with a second threshold value (Vth2) to identify the abnormal voltage sensor.

There is nothing in D1 nor in the other prior art of record which suggests that a modification of the number of sensors in D1 might be feasible.

Thus, it is the objective problem of the invention to reduce the numbers of sensors at no sacrifice to monitoring abnormality of detecting means.

To solve this problem according to the invention there is provided

first detecting means for detecting a voltage value of the battery;

second detecting means for detecting a voltage value on an output side of the converter;

battery voltage estimating means for calculating an estimated voltage value of the battery;

calculating means for calculating at least one of the difference value between the voltage value detected by the first detecting means and the estimated voltage value, and the difference value between the voltage value detected by the second detecting means and the estimated voltage value; and

monitoring means for monitoring at least one of an abnormality of the first detecting means and an abnormality of the second detecting means based on each of the difference values and a predetermined threshold value.

The subject-matter of claims 1 and 7 is therefore new (Article 33(2) PCT).

In short, two difference values (A = IVBE - VB, B = IVBE - VH) with respect to one reference value (estimated battery voltage value VBE) are calculated and each of the difference values are compared with a predetermined threshold value.

Thus the present invention uses two voltage values (VB, VH) detected by detecting means, and one estimated battery voltage value (VBE) which is calculated, not detected by detecting means.

In contrast thereto, in D1 all voltage values which are used for determining abnormality are detected by associated sensors.

The solution to this problem proposed in claims 1 and 7 of the present application appears inventive in the sense of Article 33(3) PCT because there is no suggestion in D1 and the other prior art documents that one of the detected voltage values in D1 could be replaced by an estimated voltage value.

Claims 2-6 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in EP1281562 is not mentioned in the description, nor is this document identified therein.

The features of the claims are not provided with **reference signs** placed in parentheses (Rule 6.2(b) PCT).